



President's Malaria Initiative
UGANDA INDOOR RESIDUAL SPRAYING (IRS) PROJECT – PHASE II

END OF SPRAY REPORT- ROUND FOUR
April – June, 2014



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UGANDA INDOOR RESIDUAL SPRAYING (IRS) PROJECT PHASE II END OF SPRAY REPORT

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Cover: Spray operator dissolving insecticide, Kole district, April 2014

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The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

Acronyms

CDFU	Communications for Development Foundation Uganda
DEO	District Environmental Officer
DHT	District Health Team
DLG	District Local Government
DSO	District Supplies Officer
DVCO	District Vector Control Officer
ECO	Environmental Compliance Officer
FC	Field Coordinator
IEC	Information, Education and Communication
IRS	Indoor Residual Spraying
LC	Local Council
LLINs	Long Lasting Insecticide Nets
M&E	Monitoring and Evaluation
MoH	Ministry of Health
ODK	Open Source Data Kit
PMI	President's Malaria Initiative
SBCC	Social Behaviour Change Communication
SMS	Short Message Texting
SM	Store Manager
SMT	Senior Management Team
SK	Store Keeper
SO	Spray Operator
VHT	Village Health Team
WHO	World Health Organization

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Executive Summary

With one of the highest malaria cases in the world, prevention and treatment of malaria is a top priority of the government and Ministry of Health in Uganda. The Abt led USAID-funded Uganda indoor residual spraying (IRS) Phase II project collaborates with district health authorities to spray households in 10 districts in northern Uganda, protecting a population of nearly 2.6 million. The Uganda IRS Phase II project (June 2012- June 2017), builds on the achievements of Phase I, which was implemented from July 2009 – June 2012.

During the period of March – May, 2014, the project successfully completed IRS spray round four, achieved 92.6 percent coverage, protected 2,565,899 people including 538,890 children under five, and 69,438 pregnant women. The project sprayed a total of 844,576 houses during this spray round, and successfully implemented several preparatory activities, including: micro-planning meetings, stores and soak pit assessment and renovation/repairs, logistics distribution, spray teams recruitment and orientation, environmental compliance and health and safety measures. In group A districts, spraying commenced on March 31, and ended by May 1, 2014, while in group B districts, the spray period lasted from April 22-May 23, 2014. With the exception of two districts, Kitgum and Lamwo, all the other project districts: Agago, Amuru, Apac, Gulu, Kole, Nwoya, Oyam, Pader, attained the target coverage of 90 percent. , The average number of houses sprayed per spray operator (SO) per day was 11, while the average insecticide usage rate was 2.6 households per sachet.

During spray round four, the project introduced the following innovations: stronger collaboration between the district leaders through formation of district IRS task forces, use of smart phones in Agago, Kole and Oyam for transmission of spray data by storekeepers on a daily basis, and payments of spray team members through MTN mobile money for all the 10 project districts. To minimize damage to the soak pits after spraying, all the 273 soak pit fences were constructed with “live” fencing poles, of which 256 sprouted successfully.

The project continued to face the ongoing challenge of insecticide pilferage and abuse, and took effective and timely remedial actions including tracking down the culprits and ensuring that the guilty individuals were prosecuted. Heavy rains, especially during logistics distribution and spraying in group A districts, slowed down the operations. Other competing community activities including national identity card registration, and registration for long lasting insecticidal nets diverted the attention of local councils who are crucial for IRS mobilization. The cultivation season in some districts, particularly in Kitgum and Lamwo, also interfered with spraying, as it led to some households shifting to farmlands far away from their usual residences, and household occupants were unavailable when the SOs came to spray their houses.

I. Background

The Uganda Indoor Residual Spraying (IRS) Project Phase II, led by Abt Associates is a continuation of the President's Malaria Initiative (PMI) IRS program in Uganda, and builds on the achievements attained in Phase I (implemented from July 2009 – July 2012). The Phase II, five year project commenced on June 26, 2012, and will end on June 25, 2017. The overall objective of this project is to achieve the PMI Uganda targets in IRS. In particular, the project contributes to USAID/Uganda's Development Objective 3, a comprehensive effort to improve outcomes in health, HIV/AIDS and education in Uganda through the following project objectives:

- a. High quality, safe and effective IRS program implemented;
- b. National capacity to conduct IRS developed;
- c. Comprehensive monitoring and evaluation (M&E) of the IRS program performed.

In addition to Abt, the project is supported through two main subcontractors: Communications for Development Foundation Uganda (CDFU) and EnCompass LLC.

2. Summary of key spray round activities

2.1. Operations

a. District level consultations

Preparations for spray round four began in early January, 2014. The project's field coordinators (FCs) and store managers (SMs) conducted district assessments, and held consultation meetings with the district IRS teams to exchange ideas and plan for this spray round. These assessments involved ascertaining the availability of key human resources including sub-county supervisors and parish store keepers (SKs), and confirming their willingness and availability to participate in spray round four.

b. Micro planning

Between February 11-14, 2014, the project successfully and efficiently conducted micro-planning meetings in all the project districts, thereby reducing the time for this activity. These meetings which were led by the district health teams (DHTs), and supported by project staff, focused on sharing experiences and lessons learned from the last spray round, and using them to plan for spray round four. A total of 375 participants, (102 sub-county supervisors and 273 SKs), the majority of whom were VHTs attended these sessions, while 111 facilitators (5 MoH, 18 project staff, 88 DHTs) helped guide these trainings. The DHTs who facilitated the micro-planning meetings included: IRS focal persons, District Environmental Officers (DEOs), District Health Inspectors, District Vector Control Officers (DVCOs), District Supplies Officers (DSOs) and the District Biostatisticians. DEOs, Local Council Five Chairperson, Resident District Commissioners, Secretaries for Health and the project's senior management team (SMT) attended selected sessions. USAID Contracting Officer, Mr. Joel Kisubi attended some sessions in Amuru and Gulu districts.

Additionally at these sessions, refresher training for parish SKs and sub-county supervisors was conducted to enable them deliver quality IRS. Key training areas included community mobilization, adhering to spray schedules and proper spray techniques, ensuring quality data and high IRS coverage, minimizing insecticide pilferage, and conducting effective monitoring and evaluation of IRS activities.

c. Sub-county spray team recruitment and orientation

After the micro planning meetings and training of supervisors and SKs, FCs worked in collaboration with the district IRS teams and sub-county officials to recruit spray teams. This exercise involved vetting of candidates that turned up for recruitment to eliminate spray team members with bad track records from the previous spray rounds. Additionally, this exercise enabled the communities to select trustworthy members amongst them to serve as spray team members. A total of 3247 spray operators (SOs) participated in round four, of whom 1019 (31.4 percent) were new entrants and 620 (19.1 percent) were females. The new spray team recruits replaced those who had been dismissed in round three, and also those that failed to turn up for confirmation during round four recruitment. In addition to the SOs, other spray team members recruited included wash persons, and security guards.

All the recruited spray team members (old and new) underwent orientation to gain the knowledge and skills required for successfully conducting IRS activities. Pre and post tests were administered to the participants as a means of assessing the knowledge gained from the trainings. The SO orientation for group A and B districts were conducted from March 24-28, 2014 and April 14-18, 2014 respectively. The parish SKs led these three day sessions, supported by sub-county supervisors, and project staff as appropriate. DHT members which include District Biostatisticians, DEOs, DVCOs, and DSOs from the respective districts, supervised these sessions.

d. Logistics distribution for group A and B districts

In preparation for spray round four, the SMs with the support of selected SO's team leaders carried out assessment and repair of the spray pumps in all the project districts. The assessment revealed that the main problems of the spray pumps were leakages, due to damaged or weakened seals and/or some malfunctioning parts such as nozzles, lances and rubber seals, which were subsequently replaced. Of the 4371 pumps assessed, only 1712 (39.3 percent) were in good working condition, and did not need any repairs, while 2.1 percent were damaged beyond repair. Those that were damaged beyond repair, had their essential parts completely worn out, and were not amenable to repairs. Keeping this in mind, the project procured 200 pumps to replace the damaged ones.

The project's logistics team in collaboration with DSOs, distributed IRS equipment and supplies to the 273 stores in a timely manner, beginning with group A districts. These districts received their logistics in the first week of March, in preparation for spraying which commenced on March 31, 2014. The distribution of items to parish stores in group B districts was also accomplished before the scheduled spray start date of April 22, 2014.

2.2. Capacity building

a. Training of supervisors and store keepers

As mentioned above, in preparation for spray round four, trainings for parish SKs and supervisors were conducted between February 11 -12, and 13 -14, 2014 in group A and B districts respectively. Key training areas included: preparation before spraying - inspection of houses, pump servicing and maintenance, community mobilization approaches; spraying activities - constituting insecticide, use of personal protective equipment (PPEs), environmental compliance, personal hygiene, correct recording and monitoring of IRS data (house found, houses sprayed), appropriate transmission of short message service (SMS) data; and post spraying activities - proper waste management and retrieval of supplies. The pre and post-tests training results showed improved performance among participants across all districts.

b. Data entry clerks training

The project conducted refresher training for data entry clerks on using the IRS database application from March 19-31, and April 2 -22, 2014 for group A and B districts respectively. Group A districts had 10 (4 old and 6 new; 7 males and 3 females) while group B districts had 11 (9 old and 2 new; 2 male and 9 female) trainees. The data entry clerks who had been previously recruited benefited from this refresher training, while the new clerks were equipped with knowledge and skills for handling IRS spray data.

c. Training of spray team members

As mentioned in the section above, in preparation for spray round four, all the newly recruited and old spray team members went through a three day orientation on spray techniques, data capture and recording, insecticide management, personal protection measures and environmental compliance measures.

d. Smart phone training

In April 2014, the project conducted a training on smart phone usage for spray data transmission, in three group B districts of Agago, Kole and Oyam. The project's M&E Manager and Ms. Nancy Brown from Abt Associates headquarters, organized a training of trainers on smart phone usage for IRS data capture for the Gulu field office. Thereafter, the trainers trained 75 SKs on smart phone usage in the above mentioned pilot districts. During spraying, the SKs entered the summarized store records in specially designed forms that were installed on their smartphones. These forms were then submitted to a central database in the server. Based on the data received, the project's M&E Manager compiled reports capturing: spray progress, houses found and sprayed, total and breakdowns of population, sachets used and remaining, and insecticide usage rate, and sent them to the project's SMT and field staff, who used the information to monitor spray progress, insecticide use and stock levels.

Figure 1: SKs from Agago district scrutinize their smart phones, April 2014



2.3. Environmental compliance monitoring

a. Stores and soak pit verifications and renovations

The projects' Environmental Compliance Officer (ECO), together with the FCs and DEOs conducted pre – IRS inspection of stores and soak pits in group A and B districts. This was done to assess availability and suitability of stores, and to identify parish stores and soak pits that needed to be repaired or relocated. The verification revealed that 96.7 percent of the parish stores were in good condition, and only 3.3 percent (14) stores needed minor repairs. However, 74 percent of soak pits required renovations, while 412 bath shelters were reconstructed. Renovations of soak pits and bath shelters were carried out by individual spray teams. The ECO and other project staff in collaboration with the DEO, carried out environmental compliance inspections of all 273 parish stores and soak-pits throughout the spraying period to ensure safe solid and liquid waste management. All parish stores also underwent post – IRS inspection to make sure that the IRS stores, soak pits and their surroundings were clean without any insecticide contaminated materials (IRS wastes) being left behind, and that soak pit gates were properly secured.

The ECO in collaboration with the project's logistics team successfully collected all the IRS waste from the 273 parish stores and transported it to the central waste store in Gulu. The collected IRS waste will be incinerated before the end of June, 2014. Overall, in round four, the project adhered to all environmental guidelines and followed proper IRS waste management measures.

b. Health and safety measures

Health and safety measures of spray team members were instituted before spray round four. These measures included conducting medical examinations on all personnel who showed up for recruitment, including pregnancy tests on all women. All pregnant and lactating mothers were excluded from IRS activities. The project distributed Atropine, an antidote for carbamate poisoning to all the hospitals, health center IIIs and IVs, and provided fully stocked first aid boxes to all group A and group B parish stores.

2.4. Entomological monitoring activities

a. Pre IRS pyrethrum spray catches

Pre - IRS pyrethrum spray catches (PSCs) were conducted in 192 houses from 16 sentinel sites in the 10 project districts. Of the total 14 female *Anopheles gambiae* s.l. that were caught, seven, three and two were found in Oyam, Nwoya and Kitgum, respectively. Additionally, one *Anopheles gambiae* s.l. was also caught in Amuru, and one in Lamwo. One female *An. funestus* was caught in Apac district. However, it should be noted that Culicines, the 'nuisance' mosquitoes were caught in all the sentinel sites in the 10 project districts.

b. Post –IRS pyrethrum spray catches

Post-IRS PSCs were conducted in 204 houses in all the IRS districts. A total of eight female *Anopheles gambiae* s.l. malaria vectors were caught, of which seven were from Apac (three in Apac town council and four in Aduku sub-county)) and one from Minakulu sub-county in Oyam. The project confirmed that the houses in Aduku sub-county where these mosquitoes were caught had been re-smeared

immediately after spraying. No mosquitoes were found in the remaining IRS districts, although many Culicine mosquitoes were caught in all the sentinel sites.

c. Post-IRS wall bio-assay studies:

To assess the quality of spraying, the project conducted a total of 153 cone tests in May, 2014 in all the IRS project districts. In the IRS districts, all mosquitoes exposed to the three different types of sprayed wall surfaces (brick plastered painted, brick plain, mud and wattle) were knocked down within 20-50 minutes after exposure, with the exception of Apac, where four out of 30, and eight out of 30 mosquitoes, survived 60 minutes' exposure in Aduku sub-county, and Apac town council respectively. However, all (100 percent) of the exposed vectors died after the 24 hours holding period. These PSCs and wall bio-assay results are a testimony to the effectiveness of Bendiocarb against malaria vectors in northern Uganda, and to the superior quality spraying done in the sentinel sites.

2.5 Social and behavior change communication activities

As with every round of spraying, the project's information, education and communication (IEC) /social behavior change communication (SBCC) lead partner, CDFU in collaboration with the DHEs, carried out IEC/ SBCC activities to inform and mobilize the communities for spraying. They used interactive radio talk shows, radio spot messages as well as radio announcements to communicate key messages, before, during and after spraying. The radio spots were aired twice a day to remind the communities about spray schedules and solicit their support and compliance with IRS. Radio announcements were aired to remind communities about the scheduled spray dates, and reinforce radio spots and talk shows during the spraying exercise.

A total of 50 interactive radio talk shows were aired in the 10 districts for spray round four. Guest speakers at the talk shows included DHT members, district political leaders, community, cultural and religious leaders. The pre-IRS talk shows were used to mobilize the population and urge them: to open up their houses to be sprayed, provide water to SOs for mixing insecticides, witness the mixing of the insecticides, appropriately dispose of the dead insects and insecticide contaminated dust. The shows also emphasized the need for continued use of insecticide treated nets even when the houses were sprayed. Specific topics namely insecticide pilferage, data falsification and non-compliance with IRS, were addressed in the talk shows. Additionally, the post IRS talk shows provided feedback on IRS implementation, shared best practices, challenges encountered during the spray exercise, as well as appreciated the communities for their participation and support.

A total of 676 radio spots and 125 announcements were aired during this spray round. There was an increase in the intensity of radio spots and radio talk shows mainly to emphasize the need to use long lasting insecticidal nets (LLINs) in addition to IRS. The USAID funded Communication for Healthy Communities project supported the Uganda IRS project with an additional 388 radio spots and four talk shows. This support helped enhance the ongoing radio activity and increased the intensity of message transmission to the community during this spray round.

3. Summary of results and analysis

The section provides a snapshot analysis of IRS coverage, population protected, insecticide usage rates and performance of spray teams in spray round four (Table 1). Results from spray round four revealed that most of the group B districts performed better than group A ones. This is not entirely surprising,

given that group A includes both Gulu which has a larger urban population than the rest, and Kitgum which historically has a track record of non-compliance by communities and political leaders.

3.1. Households sprayed

In spray round four, a total of 844,576 houses were sprayed in the 10 IRS project districts. This was about one percent less than the previous spray round. Of these, only 1.2 percent of the houses were partially sprayed. Various reasons contributed to the minor reduction from round three, including absentee households due to the cultivation season, and non-compliance by community leaders, district leaders and other authorities at different levels which led to inadequate mobilization and low community compliance in some districts. Additionally, this can also be attributed to improved data capture due to intensified on-the ground supervision and monitoring which reduced data falsification (ghost houses). However, in three districts the total number of houses sprayed increased, as compared to round three: Apac had the highest increase of 11.6 percent; while Kileleshwa and Gulu had marginal increases of 1.2 percent and one percent respectively (Table 2 and Figure 2).

Table 1: Summary of key IRS indicators for round four, April - June 2014

SNo	INDICATOR	DISTRICTS										TOTAL
		Kitgum	Lamwo	Pader	Agago	Apac	Kole	Oyam	Amuru*	Nwoya*	Gulu*	
1	No of districts sprayed	1	1	1	1	1	1	1	1	1	1	10
2	Targeted households	71,066	75,996	93,895	113,839	98,399	71,138	103,141	85,356	38,270	168,667	919,767
3	Total households found	71,284	72,918	93,686	109,705	103,919	70,470	99,925	82,395	35,232	172,050	911,584
4	Households fully sprayed	57,619	64,906	90,291	105,527	96,136	64,453	92,114	77,380	33,370	153,053	834,849
5	Households partly sprayed	439	37	54	122	3,599	2,037	2,466	12	17	944	9,727
6	Total households fully and partly sprayed	58,058	64,943	90,345	105,649	99,735	66,490	94,580	77,392	33,387	153,997	844,576
7	Households not sprayed	13,226	7,975	3,341	4,056	4,184	3,980	5,345	5,003	1,845	18,053	67,008
8	% of households partly or fully sprayed	81.4%	89.1%	96.4%	96.3%	96.0%	94.4%	94.7%	93.9%	94.8%	89.5%	92.6%
9	% of households not sprayed at all	18.6%	10.9%	3.6%	3.7%	4.0%	5.6%	5.3%	6.1%	5.2%	10.5%	7.4%
10	Targeted population	214,811	227,419	282,174	368,166	265,046	190,807	274,821	266,212	116,365	502,525	2,708,346
11	Total population Found	222,759	223,082	287,473	364,942	282,983	188,361	271,591	260,147	110,277	543,406	2,755,021
12	Female population protected	94,316	102,691	143,176	178,664	139,553	91,627	131,931	126,119	54,170	248,098	1,310,345
13	Male population protected	91,672	99,000	135,353	173,255	133,905	87,189	126,704	121,892	50,902	235,682	1,255,554
14	Total population protected	185,988	201,691	278,529	351,919	273,458	178,816	258,635	248,011	105,072	483,780	2,565,899
15	Total population not protected	36,771	21,391	8,944	13,023	9,525	9,545	12,956	12,136	5,205	59,626	189,122
16	% of population protected	83.5%	90.4%	96.9%	96.4%	96.6%	94.9%	95.2%	95.3%	95.3%	89.0%	93.1%
17	% of population not protected	16.5%	9.6%	3.1%	3.6%	3.4%	5.1%	4.8%	4.7%	4.7%	11.0%	6.9%
18	No. of children under five protected	37,055	38,953	61,842	79,506	55,413	33,455	51,848	57,731	25,879	97,208	538,890

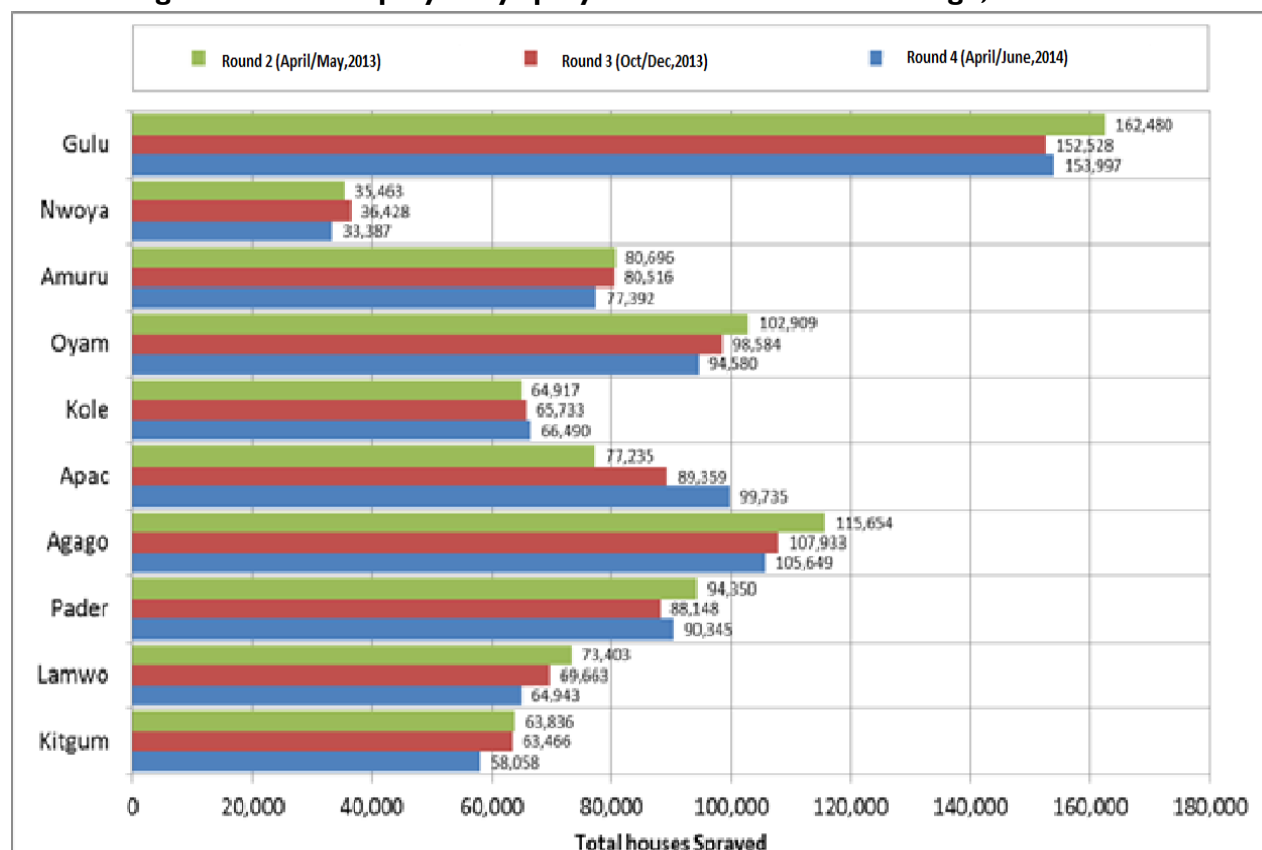
SNo	INDICATOR	DISTRICTS										TOTAL
		Kitgum	Lamwo	Pader	Agago	Apac	Kole	Oyam	Amuru*	Nwoya*	Gulu*	
19	No. of pregnant women protected	3,547	4,206	9,590	11,958	5,927	3,417	5,696	6,841	3,408	14,848	69,438
20	No. of mosquito nets found	14,953	11,730	29,190	43,195	36,272	14,652	27,617	9,277	5,592	59,543	252,021
21	No. of children under 5 sleeping under a net	10,092	8,839	20,669	28,568	19,006	8,196	15,692	7,938	3,630	28,705	151,335
22	No. of insecticide sachets used	22,516	24,166	33,292	40,703	38,991	26,449	39,405	29,675	13,067	60,876	329,140
23	Average number of households sprayed per sachet	2.6	2.7	2.7	2.6	2.6	2.5	2.4	2.6	2.6	2.5	2.6
24	Number of spray operators	227	256	335	413	397	268	363	266	132	590	3,247
25	Average number of households sprayed per spray operator per day	11.1	11.0	11.7	11.1	10.0	10.3	11.3	12.6	11.0	11.3	11.3
26	Average number of spray days	23	23	23	23	25	24	23	23	23	23	23

*Districts that sprayed for the 9th round since the start of IRS project in Northern Uganda

Table 2 : Total houses sprayed by status, districts and spray rounds in 2013 and 2014

District	Round 4 (April/June, 2014)			Round 3 (Oct/Dec, 2013)			Round 2 (April/May, 2013)		
	Fully sprayed	Partially sprayed	Total	Fully sprayed	Partially sprayed	Total	Fully sprayed	partially sprayed	Total
Kitgum	57,619	439	58,058	63,042	424	63,466	63,636	200	63,836
Lamwo	64,906	37	64,943	69,663	0	69,663	73,386	17	73,403
Pader	90,291	54	90,345	88,095	53	88,148	94,304	46	94,350
Agago	105,527	122	105,649	107,870	63	107,933	115,595	59	115,654
Apac	96,136	3599	99,735	85,735	3,624	89,359	74,943	2,292	77,235
Kole	64,453	2037	66,490	63,029	2,704	65,733	62,920	1,997	64,917
Oyam	92,114	2466	94,580	95,860	2,724	98,584	100,575	2,334	102,909
Amuru	77,380	12	77,392	80,509	7	80,516	80,688	8	80,696
Nwoya	33,370	17	33,387	36,414	14	36,428	35,389	74	35,463
Gulu	153,053	944	153,997	152,030	498	152,528	161,966	514	162,480
TOTAL	834,849	9727	844,576	842,247	10,111	852,358	863,402	7,541	870,943

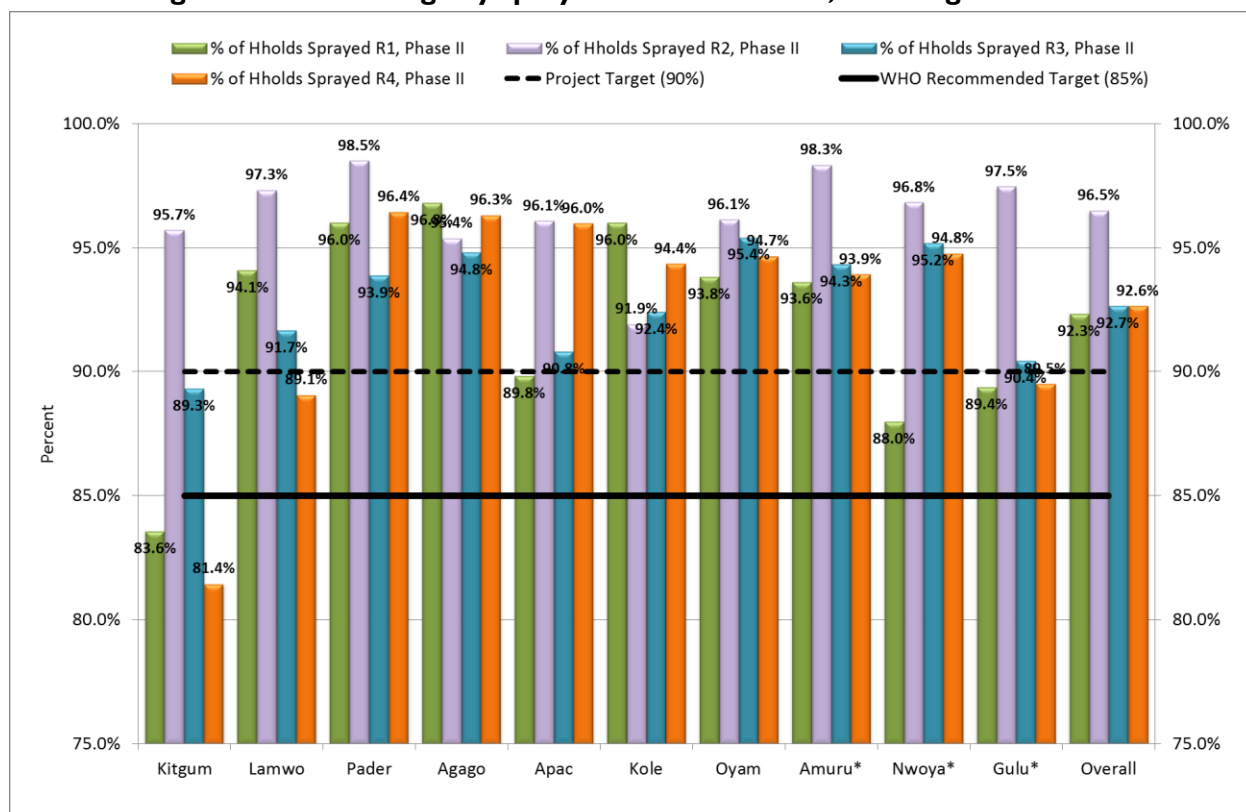
Figure 2: Houses sprayed by spray round and district coverage, rounds 2-4



3.2. IRS coverage

IRS coverage expresses the total number of houses sprayed as a percent of the total number of houses found in the project area. It is one of the standard indicators used to measure performance of IRS programs. The World Health Organization (WHO) recommends at least 85 percent coverage to be an effective malaria control intervention. During this round, the project attained overall coverage of 92.6 percent, which is only 0.1 percent less than the coverage achieved in round three (Figure 3). This is well above the WHO recommended coverage, as well as the project's target of 90 percent. While, overall average coverage for all the 10 districts exceeded project target coverage of 90 percent, Lamwo at 89.1 percent, is marginally below this target. Kitgum district recorded the lowest IRS coverage of 81.4 percent, a value below the WHO and the project's target (Table I and Figure 3). Historically, the coverage in Kitgum has been erratic, due to implementation and community mobilization challenges. Multiple factors were responsible for Kitgum's poor performance, during this spray round including: heavy rains interfered with spraying activities, as household members did not want to take their stuff outside during spraying; farming communities shifted far from their residences to be near their farms, which resulted in houses being locked during the time of spraying; poor community mobilization by district and community leaders leading to non-compliance issues; competing priorities such as the national identity card and LLIN registration which required LC I involvement and hence less time was invested by these village leaders in IRS. During this spray round, the project intensified SBCC approaches (community dialogues, task forces, enumeration of sprayable houses by LCIs) to diffuse the non-compliance issues in Kitgum, but to little or no avail. In future, the project will reinforce mobilization efforts, and introduce innovations including 'mMobilization' to try and improve Kitgum's coverage.

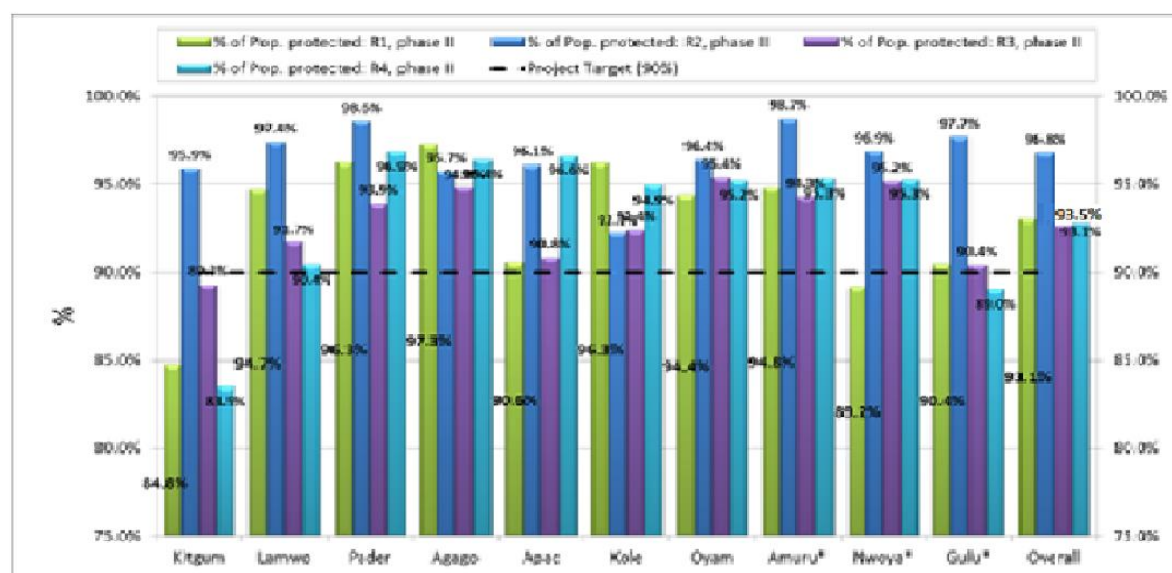
Figure 3: IRS coverage by spray round and district, covering rounds 2-4.



3.3. Population protected by IRS

The overall purpose of IRS implementation is to reduce malaria prevalence by eliminating the carrier mosquito vectors and thus interrupting the transmission cycle. Like any other malaria control and prevention interventions, IRS focuses on protection against malaria of the most vulnerable population; expectant mothers and children under five. During this round, the total population protected with IRS was 2,565,899 which is 93.1 percent of the total 2,755,021 population found (Figure 4). This was a 1.3 percent increase from the last round which protected 2,532,303 people out of 2,708,346 found. Of the total population protected in this spray round, 51.1 percent and 48.9 percent were females and males respectively. This spray round, the project also protected a total 538,890 children under five, and 69,438 pregnant women.

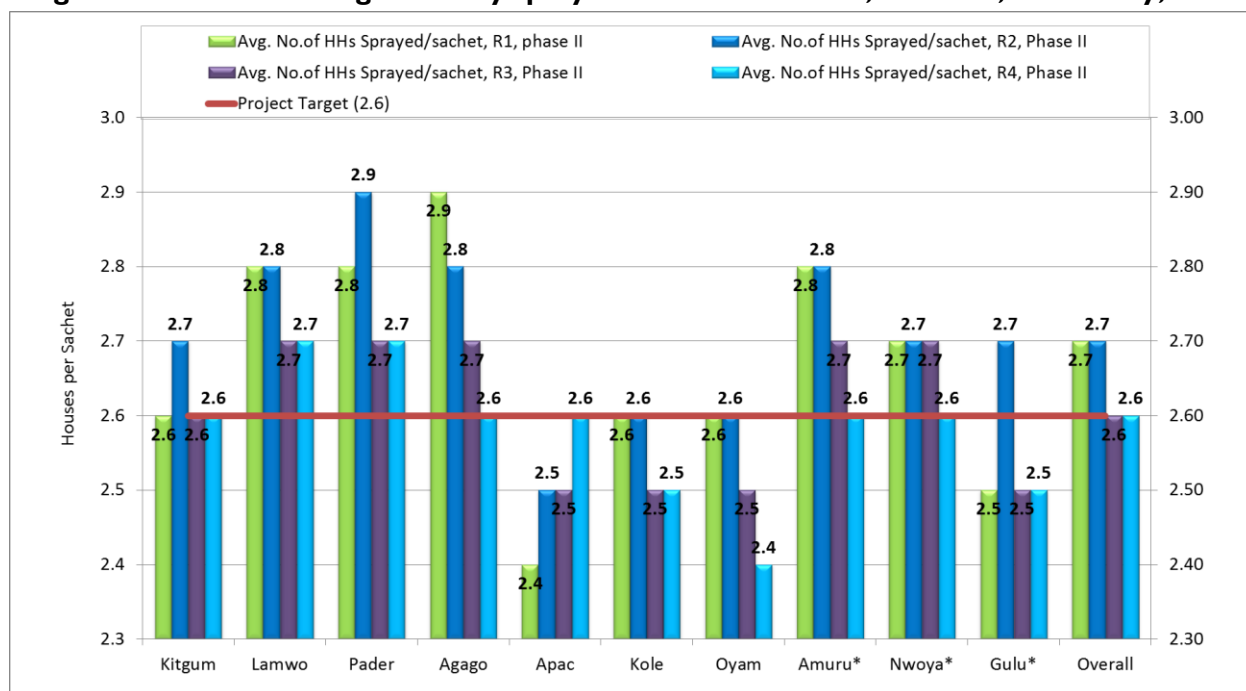
Figure 4: Percentage of population protected by spray round and district, IRS Phase II, October, 2012 – June, 2014



3.4. Insecticide usage rates

The project closely monitors the usage of insecticide during every spray round. A total of 329,140 sachets of bendiocarb were used to spray 844,576 houses (Figure 5). The overall insecticide usage rate for round four was 2.6 houses sprayed per sachet of insecticide, which was in line with the project's target. The districts of Gulu and Kole recorded usage rates of 2.5, while in Oyam, the rate was 2.4 houses per sachet. The lower insecticide usage rate implies that fewer houses were sprayed, per sachet.

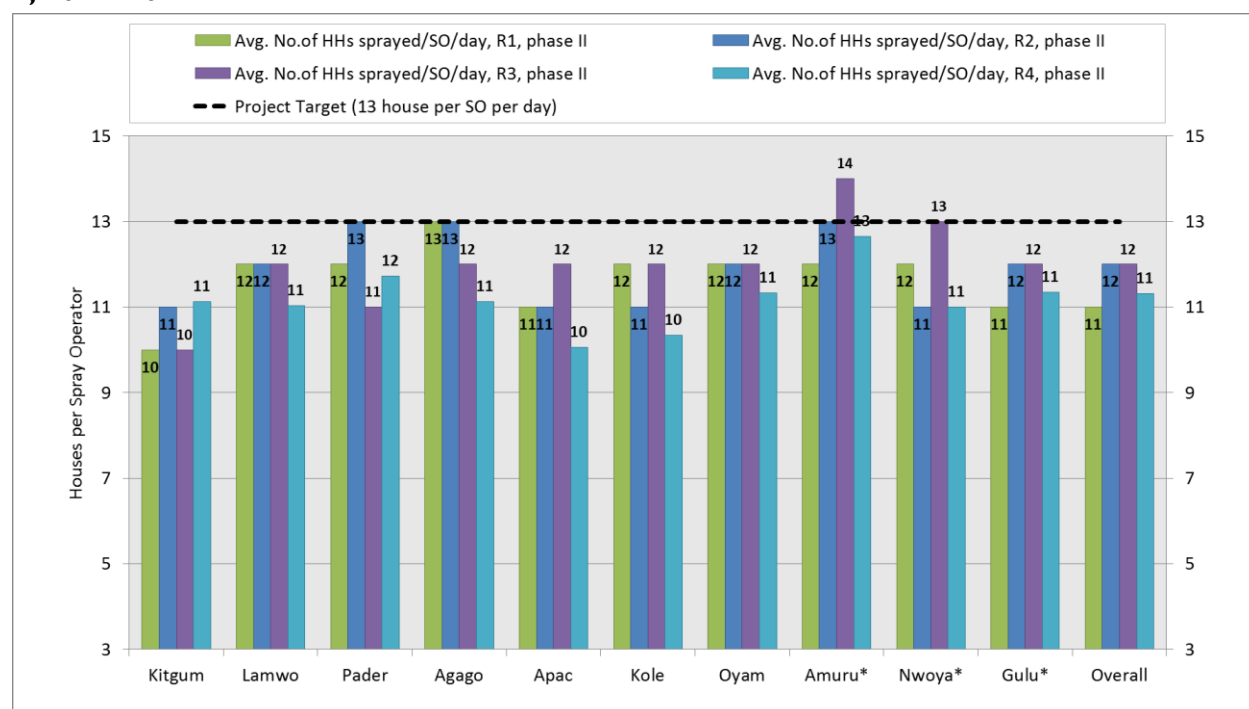
Figure 5: Insecticide usage rates by spray rounds and districts, October, 2012 –May, 2014



3.5. Performance of spray teams

Overall, the spray round was completed in 23 days, which was well within the project's target for this spray round. However Kole and Apac districts completed spraying in the 24 and 25 days respectively. In both districts, there were malpractices (data falsification and insecticide pilferage), which resulted in dismissal of spray team members, thereby interrupting activities and subsequently delaying the operations. On average, a SO sprayed 11 houses per day, which was below the target of 13 houses sprayed per SO per day. The change in insecticide usage could be the result of construction of more semi-permanent and permanent houses, which are bigger, and therefore requires more insecticide and takes longer time by SOs to spray. The spray team's performance varied from district to district (Figure 6), with Amuru recording the highest number of houses sprayed per SO per day (12).

Figure 6: Average houses sprayed per SO per day by district, IRS Phase II, round I- round 4, 2012 -2014



4. Successful interventions/ lessons learned, challenges and recommendations

4.1 Successful interventions

- The scale-up of smart phone use in the districts of Agago, Kole and Oyam districts improved capture of timely spray data for supervision. The smart phone reporting system involved compiling store reports and entering the data through the Open Data Kit (ODK) platform which was accessed by the M&E Manager for analysis and subsequent dissemination to the rest of the project team. In comparison to data submission through physical cards, the use of smart phones reduced the cost of data collection and management.
- To improve mobilization and increase the number of people reached with messages about IRS, CDFU piloted “mMobilisation” in Apac district. This SMS system controlled by a bulk SMS service provider, automatically sent out customized messages to selected audience at certain scheduled intervals. Targeted audience includes influential community members such as DHTs, head teachers, church and political leaders in the district, who have clout over their communities, and interact with them frequently. This cost effective intervention had a strong multiplier effect on the number of people reached and subsequently improved mobilization.
- Timely apprehension and punishment of insecticide pilferage culprits, helped reduce pilferage and data forgery in the intervention districts. For instance in Apac district, the project apprehended two SOs in Chawente and Alworoceng, who were prosecuted and imprisoned. Similarly, culprits from

Kitgum and Lamwo were arrested by police and the cases forwarded to court. These actions also warned spray teams from other parish stores, who were afraid of committing these offences.

- All the 273 soak pit fences were constructed with “live” fencing poles, out of which 256 sprouted successfully.
- In this spray round the project successfully rolled out payments of spray teams through the MTN mobile money payment system across all the 10 project districts.

4.2 Key challenges /constraints

- Heavy rainfall in the region sometimes interrupted the spray schedules of many spray teams. This contributed to low coverage in some villages especially in Kitgum and Lamwo, as many households feared that their properties could be destroyed by the rains. The heavy rains also caused flooding in certain areas thereby worsening the road conditions.
- In some districts, vehicles had difficulties accessing hard to reach areas. In some cases, the SOs had to walk for more than six kilometers to the intended village to conduct spraying. These SOs had to cover greater distances to reach these sparsely populated villages, which led to fewer houses being sprayed, and impacted the coverage in these districts.
- Agricultural activities kept many households occupied in the fields, away from their homes. This led to some of them missing their scheduled spray days, which contributed to low coverage in some parish stores, especially in Kitgum and Lamwo.
- The urban settings in the project area continue to pose a challenge, since most residents in these areas are business people or office workers, who most times are unavailable to open up their residences during spray season.
- The introduction of smart phones in spray round four, also faced some challenges. These included: misuse of internet data by some SKs, who ended up using their allotted quote before all the data could be submitted; some of the SKs also struggled to summarize the data accurately; the high cost of charging the phone batteries especially in Kole district; and the poor network connectivity at times which affected timely data submission in some stores.
- Other competing priorities, namely national identity card registration, and registration for LLINs distribution, kept the LCIs busy who usually play a key role in IRS mobilization. These other priorities reduced their available time to participate in IRS activities.

4.3 Lessons learned

- In this spray round, the district IRS taskforce teams were very influential, and at the fore front in handling and addressing any issues/problems that arose during the spray period. These task force teams are a strong platform for advocacy, social mobilization, and a tool for behavior change. These task forces which are made up of DHT members, district administrative and political leaders, were formed to ensure smooth implementation of IRS activities. They meet on a weekly basis during spraying, and help identify and address challenges in a timely manner. For instance as a result of this task force, during this spray round, there was better coordination among IRS team members and officials in Gulu. The Chief Administrative Officer of Gulu, provided a vehicle and fuel, as well as a

daily allowance of 8,000 shillings to each SO of Pabbo Kal to help the Apaa spray team (a hard to reach area) to complete spraying on time. This demonstrates better appreciation for IRS and the need to make concerted efforts.

- There was improved coordination between the IRS committees, spray teams, and SKs, with strong leadership and guidance from sub-county supervisors to reach households together as a team. This helped integrate both IRS and LLIN messages during mobilization, thereby mitigating the risk of preference for any particular intervention.
- The judicial system at time does not appreciate the danger of insecticide theft, and often hands out mild sentences (community service) to the culprits. For example, the SOs and their accomplices from Apac, that were engaged in insecticide pilferage, were sentenced to brief periods of community service. These are minor sentences when compared to the magnitude of crime committed, and the negative impact (death of people and livestock) that stolen insecticides can have when it falls in the wrong hands.
- VHT supervisors at the parish store levels spend more time with the spray teams in the field during spraying, which leads to improved performance of the spray teams. On the other hand, supervisors that are health assistants, usually have competing priorities and other government activities which impact their performance during the spray period, hence affecting the performance of the team as a whole.

4.4. Recommendations

- Strengthen IRS supportive supervision at all levels through continued involvement of the district IRS task force members in IRS activities in the various districts, and include the District Education Officer in this task force, to help tap the mobilization potential of the school structure in these districts.
- The project should invest more on interpersonal communication approaches for IRS mobilization such as community dialogues and focus group discussions with community members on IRS activities. Instead of printed IEC materials, these approaches will lead to more community engagement and participation in IRS.
- Implement innovative and targeted community mobilization approaches such as 'mMobilization' in urban settings, to help improve IRS coverage in these areas.
- Use mobile money in the next spray round for other types of payments such as fuel allowance for supervisors.

5. Appendix – Summary of district results by sub-county

Table 3: Pader district summary of results by sub-county

Sub-county	Houses Found	Houses Sprayed	Unsprayed houses	IRS Coverage %	Population protected					Unprotected Population Total	% of population protected
					Female	Male	Total	Pregnant women	Children < 5Years		
Acholibur	10,080	9,924	156	98.5	17,409	15,587	32,996	1,486	7,551	398	98.8
Angagura	3,757	3,743	14	99.6	5,259	5,191	10,450	235	2,349	51	99.5
Atanga	4,727	4,367	360	92.4	7,672	7,412	15,035	349	3,268	985	93.9
Awere	18,348	17,853	495	97.3	28,280	25,540	53,820	2,670	12,559	834	98.5
Kilak	5,609	5,545	64	98.9	7,633	7,976	15,609	482	3,128	142	99.1
Laguti	5,601	5,575	26	99.5	8,459	8,146	16,605	520	3,414	71	99.6
Lapul	6,434	6,312	122	98.1	10,334	9,545	19,879	445	4,661	373	98.2
Latanya	4,944	4,643	301	93.9	7,795	7,338	15,133	345	3,439	836	94.8
Ogom	5,792	5,515	277	95.2	9,473	9,109	18,582	607	4,113	840	95.7
Pader TC	7,494	6,533	961	87.2	11,567	11,280	22,847	801	4,845	2,802	89.1
Pajule	6,494	6,116	378	94.2	9,871	9,725	19,580	483	4,699	1,106	94.7
Puranga	14,406	14,219	187	98.7	19,424	18,569	37,993	1,167	7,816	506	98.7
Grand Total	93,686	90,345	3,341	96.4	143,176	135,418	278,529	9,590	61,842	8,944	96.9

Table 4: Oyam district summary of results by Sub-county

Sub-county	Houses Found	Houses Sprayed	Unsprayed houses	IRS Coverage %	Population protected					Unprotected Population Total	% of population protected
					Female	Male	Total	Pregnant women	Children < 5Years		
Aber	22,862	22,147	715	96.9	30,910	31,169	62,079	1,304	11,243	1,617	97.5
Acaba	12,176	11,416	760	93.8	15,997	14,646	30,643	638	6,031	1,722	94.7
Iceme	12,136	11,014	1,122	90.8	15,411	14,511	29,922	630	6,128	2,890	91.2
Loro	14,528	13,978	550	96.2	19,230	17,879	37,209	893	7,720	1,349	96.5
Minakulu	16,153	15,564	589	96.4	21,532	20,347	41,879	982	8,668	1,220	97.2
Ngai	10,925	9,960	965	91.2	13,363	13,278	26,641	575	5,699	2,769	90.6
Otwal	11,145	10,501	644	94.2	15,488	14,774	30,262	674	6,359	1,389	95.6
Grand Total	99,925	94,580	5,345	94.7	131,931	126,604	258,635	5,696	51,848	12,956	95.2

Table 5: Kole district Summary of results by Sub-county

Sub-county	Houses Found	Houses Sprayed	Unsprayed houses	IRS Coverage %	Population protected					Unprotected Population Total	% of population protected
					Female	Male	Total	Pregnant women	Children < 5Years		
Aboke	11,910	10,652	1,258	89.4	15,772	15,054	30,826	548	5,862	3,126	90.8
Akalo	9,394	8,646	748	92.0	11,997	10,925	22,910	347	3,821	1,656	93.3
Alito	25,563	24,547	1,016	96.0	33,531	32,129	65,660	1,412	12,589	2,517	96.3
Ayer	10,346	10,017	329	96.8	13,744	13,293	27,037	456	5,158	755	97.3
Bala	13,257	12,628	629	95.3	16,583	15,800	32,383	654	6,025	1,491	95.6
Grand Total	70,470	66,490	3,980	94.4	91,627	87,201	178,816	3,417	33,455	9,545	94.9

Table 6: Apac district summary of results by sub-county

Sub-county	Houses Found	Houses Sprayed	Unsprayed houses	IRS Coverage %	Population protected					Unprotected Population Total	% of population protected
					Female	Male	Total	Pregnant women	Children < 5Years		
Abongomola	11,726	10,858	868	92.6	14,663	13,715	28,378	570	6,150	1,684	94.4
Aduku	11,559	10,948	611	94.7	16,449	14,860	31,309	590	5,900	1,799	94.6
Akokoro	9,898	9,641	257	97.4	14,220	14,317	28,537	644	6,261	541	98.1
Apac	13,805	13,190	615	95.5	17,906	17,096	35,002	691	6,507	1,277	96.5
Apac TC	2,979	2,764	215	92.8	5,019	4,670	9,689	167	1,492	594	94.2
Chawente	9,395	9,172	223	97.6	12,845	12,606	25,451	620	5,528	466	98.2
Chegere	10,362	10,102	260	97.5	13,756	12,988	26,744	613	5,469	609	97.8
Ibuje	13,251	12,979	272	97.9	18,031	17,275	35,306	906	7,544	667	98.1
Inomo	7,041	6,668	373	94.7	9,129	8,976	18,105	331	3,348	756	96.0
Nambieso	13,903	13,413	490	96.5	17,535	17,402	34,937	795	7,214	1,132	96.9
Grand Total	103,919	99,735	4,184	96.0	139,553	133,905	273,458	5,927	55,413	9,525	96.6

Table 7: Amuru district summary of results by sub-county

Sub-county	Houses Found	Houses Sprayed	Unsprayed houses	IRS Coverage %	Population protected					Unprotected Population Total	% of population protected
					Female	Male	Total	Pregnant women	Children < 5Years		
Amuru	18,875	16,861	2,014	89.3	27,327	26,999	54,326	1,793	13,316	5,747	90.4
Amuru TC	7,986	7,568	418	94.8	12,524	12,466	24,990	914	5,640	903	96.5
Atiak	16,691	15,669	1,022	93.9	23,727	22,892	46,619	1,177	10,295	2,192	95.5
Lamogi	18,297	17,531	766	95.8	27,638	26,387	54,025	1,236	12,096	1,392	97.5
Pabbo	20,546	19,763	783	96.2	34,903	33,148	68,051	1,721	16,384	1,902	97.3
Grand Total	82,395	77,392	5,003	93.9	126,119	121,892	248,011	6,841	57,731	12,136	95.3

Table 8: Agago district summary of results by sub-county

Sub-county	Houses Found	Houses Sprayed	Unsprayed houses	IRS Coverage %	Population protected					Unprotected Population Total	% of population protected
					Female	Male	Total	Pregnant women	Children < 5Years		
Adilang	7,806	7,352	454	94.2	13,030	12,310	25,340	728	6,349	1,392	94.8
Arum	6,107	5,933	174	97.2	8,978	8,868	17,846	529	3,672	531	97.1
Kalongo TC	4,094	4,050	44	98.9	9,187	8,753	17,940	457	3,423	101	99.4
Kotomor	5,730	5,482	248	95.7	9,467	8,747	18,214	453	3,645	742	96.1
Lamiyo	4,379	4,341	38	99.1	6,397	7,275	13,672	308	3,377	101	99.3
Lapono	16,127	14,944	1,183	92.7	27,859	26,579	54,438	2,788	12,913	4,461	92.4
Lira Palwo	5,010	4,850	160	96.8	8,957	7,974	16,931	464	4,110	465	97.3
Lukole	8,868	8,639	229	97.4	14,840	15,276	30,116	1,077	6,887	658	97.9
Omiya Pacwa	8,563	8,404	159	98.1	11,574	11,382	22,956	601	4,874	432	98.2
Omot	6,559	6,212	347	94.7	9,464	8,891	18,355	413	3,987	989	94.9
Paimol	12,008	11,919	89	99.3	20,684	19,689	40,373	1,588	9,144	246	99.4
Parabongo	8,265	8,212	53	99.4	14,218	13,166	27,384	1,155	6,344	153	99.4
Patongo	3,935	3,928	7	99.8	5,881	5,640	11,521	594	2,741	23	99.8
Patongo TC	4,316	3,592	724	83.2	6,183	6,661	12,844	257	2,511	2,274	85.0
Wol	7,938	7,791	147	98.1	11,945	12,044	23,989	546	5,529	455	98.1
Grand Total	109,705	105,649	4,056	96.3	178,664	173,255	351,919	11,958	79,506	13,023	96.4

Table 9: Gulu district summary of results by sub-county

Sub-county	Houses Found	Houses Sprayed	Unsprayed houses	IRS Coverage %	Population protected					Unprotected Population Total	% of population protected
					Female	Male	Total	Pregnant women	Children < 5Years		
Awach	9,734	8,809	925	90.5	13,324	12,226	25,550	690	5,464	2,464	91.2
Bobi	12,987	10,824	2,163	83.3	15,531	14,150	29,681	629	6,072	5,445	84.5
Bungatira	7,445	6,813	632	91.5	11,506	10,439	21,945	505	4,935	1,924	91.9
GMC_Bardege	14,383	13,301	1,082	92.5	29,005	24,466	53,465	2,115	9,376	6,105	89.8
GMC_Laroo	9,185	8,394	791	91.4	15,121	13,865	28,986	1,033	5,634	2,478	92.1
GMC_Layibi	12,692	11,191	1,501	88.2	21,026	22,420	43,446	1,238	7,168	7,113	85.9
GMC_Pece	15,524	12,240	3,284	78.8	19,377	18,951	38,328	1,755	8,241	13,334	74.2
Koro	12,646	11,911	735	94.2	17,599	16,494	34,093	1,092	6,617	1,846	94.9
Lakwana	11,448	10,601	847	92.6	13,843	13,257	27,100	646	5,361	2,137	92.7
Lalogi	14,158	13,183	975	93.1	19,207	19,410	38,617	1,207	8,323	2,543	93.8
Odek	17,177	15,463	1,714	90.0	22,361	21,363	43,724	1,391	9,639	4,990	89.8
Ongako	9,491	9,312	179	98.1	15,855	14,066	29,921	962	6,049	543	98.2
Paicho	8,340	7,158	1,182	85.8	10,626	10,338	20,964	518	4,551	3,196	86.8
Palaro	4,924	4,042	882	82.1	5,916	6,442	12,358	250	2,676	2,221	84.8
Patiko	7,649	7,073	576	92.5	11,384	11,170	22,554	551	4,910	1,786	92.7
Unyama	4,267	3,682	585	86.3	6,417	6,625	13,042	266	2,192	1,501	89.7
Grand Total	172,050	153,997	18,053	89.5	248,098	235,682	483,774	14,848	97,208	59,626	89.0

Table 10: Kitgum district summary of results by sub-county

Sub-county	Houses Found	Houses Sprayed	Unsprayed houses	IRS Coverage %	Population protected					Unprotected Population Total	% of population protected
					Female	Male	Total	Pregnant women	Children < 5Years		
Akwang	5,982	4,743	1,239	79.3	7,617	7,721	15,338	271	3,213	3,133	83.0
Amida	5,087	4,631	456	91.0	7,755	7,197	14,952	281	2,955	1,100	93.1
Kitgum Matidi	6,360	5,580	780	87.7	8,455	8,187	16,642	326	3,561	1,898	89.8
Kitgum TC	11,264	7,083	4,181	62.9	14,625	13,352	27,977	433	4,515	13,129	68.1
Lagoro	5,514	4,953	561	89.8	7,747	7,454	15,201	260	3,240	1,412	91.5
Layamo	4,900	3,820	1,080	78.0	5,717	5,911	11,628	198	2,178	2,644	81.5
Mucwini	8,229	6,940	1,289	84.3	10,991	10,534	21,525	467	4,086	3,592	85.7
Namokora	6,274	5,230	1,044	83.4	8,052	7,900	15,952	279	3,298	2,728	85.4
Omiya Anyima	9,737	8,883	854	91.2	13,352	13,589	26,941	539	5,369	2,440	91.7
Orom	7,937	6,195	1,742	78.1	10,005	9,827	19,832	493	4,640	4,695	80.9
Grand Total	71,284	58,058	13,226	81.4	94,316	91,672	185,988	3,547	37,055	36,771	83.5

Table 11: Lamwo district summary of results by sub-county

Subcounty	Houses Found	Houses Sprayed	Unsprayed houses	IRS Coverage %	Population protected					Unprotected Population Total	% of population protected
					Female	Male	Total	Pregnant women	Children < 5Years		
Agoro	15,734	14,194	1,540	90.2	23,739	23,110	46,849	1,319	9,138	5,117	90.2
Lokung	9,036	7,956	1,080	88.0	12,088	11,576	23,664	512	5,150	2,790	89.5
Madi Opei	6,237	5,611	626	90.0	8,465	8,738	17,203	272	2,774	1,799	90.5
Padibe East	11,113	9,652	1,461	86.9	14,937	14,385	29,322	504	5,014	3,427	89.5
Padibe West	6,596	5,754	842	87.2	9,183	8,616	17,799	349	3,313	2,365	88.3
Palabek Gem	7,304	6,410	894	87.8	10,283	9,800	20,083	353	4,030	2,094	90.6
Palabek Kal	6,903	6,414	489	92.9	9,681	9,168	18,849	306	3,649	1,275	93.7
Palabek Ogili	5,593	5,099	494	91.2	8,225	7,864	16,089	365	3,703	1,100	93.6
Paloga	4,402	3,853	549	87.5	6,090	5,743	11,833	226	2,182	1,424	89.3
Grand Total	72,918	64,943	7,975	89.1	102,691	99,000	201,691	4,206	38,953	21,391	90.4

Table 12: Nwoya district summary of results by sub-county

Subcounty	Houses Found	Houses Sprayed	Unsprayed houses	IRS Coverage %	Population protected					Unprotected Population Total	% of population protected
					Female	Male	Total	Pregnant women	Children < 5Years		
Aber	22,862	22,147	715	96.9	30,910	31,169	62,079	1,304	11,243	1,617	97.5
Acaba	12,176	11,416	760	93.8	15,997	14,646	30,643	638	6,031	1,722	94.7
Iceme	12,136	11,014	1,122	90.8	15,411	14,511	29,922	630	6,128	2,890	91.2
Loro	14,528	13,978	550	96.2	19,230	17,879	37,209	893	7,720	1,349	96.5
Minakulu	16,153	15,564	589	96.4	21,532	20,347	41,879	982	8,668	1,220	97.2
Ngai	10,925	9,960	965	91.2	13,363	13,278	26,641	575	5,699	2,769	90.6
Otwal	11,145	10,501	644	94.2	15,488	14,774	30,262	674	6,359	1,389	95.6
Grand Total	99,925	94,580	5,345	94.7	131,931	126,604	258,635	5,696	51,848	12,956	95.2

